

Physical Abuse 101

Antoinette Laskey, MD, MPH, MBA
Professor of Pediatrics



Objectives

- Recognize common physical abuse injuries
 - Cutaneous findings
 - Sentinel injuries
 - Fractures
- Develop a diagnostic approach to potentially inflicted injuries
- Be able to accurately interpret findings for MDT partners



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What is a sentinel injury?

- A relatively “minor” injury identified in a child
- Most often in pre-cruising infant
- May not be a serious injury alone but is a sign of potentially worsening abuse
- Sentinel injuries may be missed or downplayed by medical providers
 - This results in missed opportunities to protect children



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TEN-4-FACES^p
Bruising Clinical Decision Rule for Children <4 Years of Age

When is bruising concerning for abuse in children <4 years of age? If bruising in any of the three components (Regions, Infants, Patterns) is present without a reasonable explanation, strongly consider evaluating for child abuse and/or consulting with an expert in child abuse.

REGIONS	INFANTS	PATTERNS
TEN Torso Ears Neck FACES Frenulum Angle of Jaw Cheeks (fleshy part) Eyelids Subconjunctivae	4 months and younger Any bruise, anywhere	Patterned bruising Bruises in specific patterns like slap, grab or loop marks

See the signs. Unexplained bruises in these areas most often result from physical assault. TEN-4-FACES^p is not to diagnose abuse but to function as a screening tool to improve the recognition of potentially abused children with bruising who require further evaluation.

TEN-4-FACES^p was developed and validated by Dr. Mary Calkins and colleagues. It is published and available for FREE download at <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6144441/>

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Sentinel Injuries

- 200 abused infants compared to 101 non-abused matched cases
 - 27.5% of abused infants had history of previous sentinel injury
 - None of the non-abused infants has a previous sentinel injury
- 66% of sentinel injuries were in infants <3m
- 95% occurred in patients ≤7m
- A medical provider was aware of the injury in 42% of the cases



Sheets 2013



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Types of Injuries

- Intraoral injury
- Ear injury
- Subconjunctival hemorrhage (not present in perinatal period)
- Bruises in non-mobile infants



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Oral Injuries

- Frena/Frenula/Frenum: piece of tissue attaching the lip to the gum (top and bottom) and the tongue to the floor of the mouth
- May be injured accidentally in a mobile child
 - Running with something in the mouth
 - “Face plant” with a drag
 - Falling on the face

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Oral Injuries

- If torn in an infant, very frequently associated with inflicted trauma
 - Shoving something (pacifier, bottle, medicine dropper) in the mouth
 - May be seen with suffocation/smothering
- Appearance of a lot of blood due to blood mixing with saliva
- Heals rapidly
- May look like an isolated spot of thrush when healing

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Ear Injuries

- Ears tend to be in protected location and are not commonly injured in falls
- Accidents can happen but wouldn't be “unknown” in non-mobile infants
- Injuries caused by being hit or pinched/pulled
- Can be permanently disfiguring depending on severity

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Subconjunctival Hemorrhage

- Infants DO NOT sustain subconjunctival hemorrhages from
 - Constipation
 - Coughing (unless they have pertussis)
 - Vomiting
 - Crying
- Infants DO sometimes have subconjunctival hemorrhages from delivery
 - Early documentation is key

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Subconjunctival Hemorrhage

- Subconjunctival hemorrhages in infants are often due to
 - Smothering
 - Suffocation
 - Strangulation
 - Direct injury to the eye

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Cutaneous Injuries

- Bruises are the most common presenting injury in abused children
- Bruises often are considered “minor” or “normal”
- If a medical provider sees the injury, they may underestimate its importance and not document it or the history provided for it

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Bruising by Age

- “Those who don’t cruise, rarely bruise”
- Study of almost 1000 children <36m of age
 - 20% had bruises on exam

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Bruising by Age

- By age, however, their developmental status was key
 - 0.6% <6m
 - 1.7% <9m
 - 2.2% in non-cruisers (not up on 2 feet)
 - 17.8% cruisers
 - 51.9% walkers
- Sugar, et al, 1999

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Cutaneous Findings

- Remember, there are very few, truly pathognomonic findings of child abuse
- History is essential
- Developmental status is also very relevant
- Take pictures with and without size standards
- Palpate the area
- Objectively document, don’t subjectively speculate

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Timing the Injury

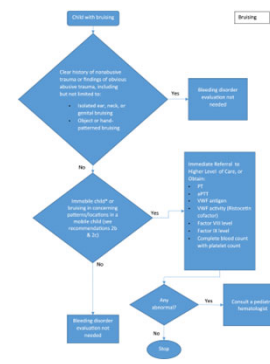
- Bruises CANNOT be dated clinically
 - Evolution of bruise varies based on body fat, UV exposure, depth and extent of injury, skin complexion
- Guessing at an age is not helpful and may be misleading
- “Bruising of more than one age” is suggesting you know any age of any bruise

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Diagnostic Approach

- Take a GOOD history
 - How long has it been there?
 - What is the story—open ended narratives, use quotes, clarifying questions
 - Others in household with similar findings?
 - Changes?
 - Concurrent symptoms?
 - Recurrence?

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Diagnostic Approach

- Complete physical exam
- Pictures
- Review the chart
- Consider labs
- Consider consults
 - SHF
 - Derm
 - ID

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FRACTURES

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Fractures

- 55%-70% of all inflicted fractures occur in children <12 months of age
- **80%** of all inflicted fractures occur in children <**18 months** of age
- Only 2% of accidental fractures occur in children <18 months of age

Merten, et al 1983
 Krishnan, et al 1990
 Gross, et al 1983
 Worlock, et al 1986

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Identifying Fractures

- Fractures in infants can be *VERY* hard to identify during a clinical exam
- Overlying bruises are rare
- Swelling can be difficult to appreciate
- Pain presents non-specifically

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Key Point

- No fracture is *pathognomonic* for abuse, though some have a high specificity
 - Posterior rib fractures
 - Metaphyseal fractures
- Spiral fractures, in general, have a *low specificity* for abuse
 - Exceptions are in non-mobile infants

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Specific Fracture Features

- Can be seen in child abuse, but low specificity
 - Long-bone fractures (femur, tibia, humerus)
 - Linear skull fractures
 - Fractures of distal extremities in > 1 year old
- More likely to be accidental
 - Clavicle fracture
 - Supracondylar humerus fracture
 - Children > 1 year old fall while running

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Keys to Making the Diagnosis

- A thorough and comprehensive HISTORY
 - ...of the traumatic event—from eyewitnesses when possible
 - ...of child's development, diet, family and social environment

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Keys to Making the Diagnosis

- Documentation
 - History
 - Actual quotes AND the original question
 - Legible and intelligible (non-medical audience)
 - Objective: what is said, not what you interpret was being said

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Diagnostic Evaluation



- Skeletal surveys are **mandatory** in evaluation of physical abuse in child less than 2y
- May be used in children 2-5y
- Little use over 5y
- Post-mortem studies also important
- Minimum of 20 films

http://www.acr.org/SecondaryMainMenuCategories/quality_safety/guidelines/du/mus/skeletal_surveys.aspx

Google: ACR Skeletal Survey

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Posterior Rib Fractures

- Rib fractures can be difficult to detect acutely due to lack of displacement and overlying lung markings
- Callous formation can take 10-14 days to be radiographically evident, hence the value of follow-up skeletal surveys
- Posterior rib fractures may not be painful or obvious to non-offending caregiver

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Key Point: Posterior Rib Fractures

- Autopsy specimen of 2 week old infant who died of AHT
- Post-mortem SS was negative
- Posterior rib fractures with callous seen at autopsy
 - Post-mortem CT reviewed with new information and fractures could be seen—barely

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Posterior Rib Fractures

- Posterior rib fractures do NOT happen from CPR, crush injuries, falls or impacts
- They occur due to A/P squeezing of the chest
 - May be associated with clavicular fractures if the thumb is positioned over the clavicle with pressure exerted
- Caregivers that cause these fractures report feeling it and sometimes hearing it break

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Distal Femoral Buckles

- Associated with axial load to the knee
 - Falls from a surface (bed, changing table)
 - Being dropped and landing on a knee
 - Sitting devices that baby gets stuck being put in or being removed
- Can be a forceful bending while holding lower legs
 - Cannot sort out accident v. inflicted based on fracture
 - If presenting history is axial load as above and then the fracture is found, that could be a strong indicator of an accident
 - When in doubt, get a skeletal survey

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Key Point

- Sometimes the caregiver who presents to care is not the caregiver who was with the patient when it happened
 - Do not assume a “changing history” is the reason the information changes as people gather information, it may be additional data is sought or obtained
 - Eyes on history is always the best, even if it isn't an adult
 - An absence of a history does not always mean abuse or that someone is lying

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Key Point

- No matter the history, a complete, thorough physical exam is necessary
- A skeletal survey may be necessary
- Consultation may be necessary
- Don't assume...
 - Nice families can have bad things happen
 - “Not nice” families may not have done anything wrong

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Metaphyseal Corner Fractures

- Almost exclusively in children <18m of age
- Happens when the corners or ends of the long bone physically are separated from the shaft through a yank or pull
- May be difficult to discern with a single view
 - Consider the use of laterals and repeat images to better define
 - Adult radiologists may miss these due to specific age in which it is found

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Siblings at Risk

- Siblings or other children in care of the same adult(s) require medical evaluation under a “sibling at risk” protocol
 - Complete skin exam in all children
 - Skeletal surveys in children <12 months
 - Consider head CTs in children <6 months or if findings on exam
 - Consider forensic interviews of verbal children
- Twins/triplets/higher order multiples are at especially high risk for abuse by same caregiver

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Reminder

- People who cause these injuries rarely intend to hurt the child
- Sentinel injuries are very frequently the result of a frustrated caregiver who is handling the infant more roughly than they would normally or have in the past

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Final Points to Remember

- Injuries in pre-verbal children often require multidisciplinary collaboration
- Thorough histories are essential to prevent over and under calls
 - Be wary of calling something a “changing history”, it could be poor history taking or poor documentation
- Skeletal surveys in children less than 2 years of age are necessary adjuncts to clinical evaluation of fractures when abuse is suspected